


Health Effects from Environmental Odors

**Agency for Toxic Substances
and Disease Registry
(ATSDR)**

A dark teal silhouette of a mountain range is located in the bottom right corner of the slide, extending from the right edge towards the center.

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Disclaimer

The findings and conclusions in this presentation have not been formally disseminated by ATSDR and should not be construed to represent any agency determination or policy



Factors that may Influence Perceptions and Reactions to Odors



"Signal detection"



"Miasma theory"

Sense of Olfaction in Environmental Health



Odors can make people aware of potentially dangerous chemicals at exposures *below* harmful levels

Threshold Limit Value (TLV)

- ◆ What is TLV?
- ◆ Examples of TLV's

Sequence of Sensory Effects

- ◆ Detection
- ◆ Recognition/ID
- ◆ Annoyance
- ◆ Intolerance
- ◆ *Perceived Irritation*
- ◆ *Somatic Irritation*
- ◆ Toxicity (Acute/Chronic)

Sources of Environmental Odors

Industrial

- ◆ Wood treatment plants
- ◆ Paper Mills
- ◆ Landfills
- ◆ Petroleum refineries
- ◆ Solvent handling facilities
- ◆ Waste-water treatment

Non-Industrial

- ◆ Pesticide and fertilizers applications (e.g. Ammonia)
- ◆ Animals feeding (CAFO)
- ◆ Diesel exhaust
- ◆ Sewage

Environmental Odors Complaints

Odors emitted from any of the previously mentioned sources elicit **far more community complaints** than **odorless** air pollutants such as Nitrogen Dioxide

S. Schiffman", Science of Odors as a Potential Health Issue. J. Env. Qual. 34:129-138(2005)

Odorous Area Chemicals

◆ Acetaldehyde

◆ Acetone

◆ Ammonia

◆ Arsine

Other Impacts of Environmental Odors

- ◆ Perceived dangers
- ◆ ↓ Quality of life
- ◆ ↓ Sense of well being



Mechanism of Action

3 Mechanisms:

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graph TD; A[3 Mechanisms:] --- B[At irritation level]; A --- C[Below irritation level]; A --- D[Co-pollutant]
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***At* irritation
level**

***Below* irritation
level**

Co-pollutant

Health Effects

- ◆ Odors **sensitivity** and **response** *varies* from person to person
- ◆ The same odor at the same exposure level can have *different effect* in different people

Health Effects

- ◆ Subjective (not measurable)
- ◆ Objective (measurable)

Health Effects

- ◆ Mucous membranes
- ◆ Upper & Lower Respiratory Ways
- ◆ Heart and Blood Vessels
- ◆ Stomach and Intestines
- ◆ Brain
- ◆ Psychological
- ◆ General well being

Individual Response Vary

- ◆ Age
- ◆ Gender
- ◆ Genetics
- ◆ Medical History
- ◆ Life Style (Outdoor exercise)
- ◆ Social Habits
 - Tobacco use/ETS
 - Alcohol abuse

Environmental Hazard Variables

- ◆ Aggregate characteristics
- ◆ Dose
- ◆ Duration
- ◆ Frequency
- ◆ Environmental cue

Respiratory Effects from Environmental Odors

Environmental odors that are **irritating to the lower respiratory tract** can exacerbate Asthma episodes

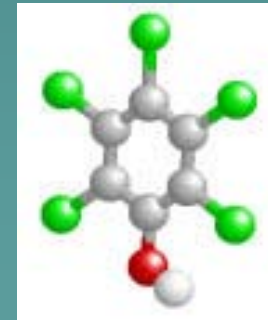


Sensitive Population

- ◆ Asthmatics
- ◆ Chronic Obstructive Pulmonary Diseases (COPD)
- ◆ Depression
- ◆ Hypersensitivity

How can we protect communities?

- ◆ Preventing exposure
- ◆ Removing the person from the source
- ◆ Technology to mitigate airborne emissions



In Conclusion

- ◆ Unpleasant odors **have been** recognized as "**warning**" signs of potential risks to human health, not direct triggers of health effects
- ◆ **We now know** that odor sensations from environmental sources might indeed **cause health symptoms** depending on many individual & environmental factors

Today the thought is that

Odors in Public Health practice are not only warning signs of potential health effects, but may in itself be the *direct cause* of some symptoms in humans.

(Science of Odors as a Potential Health Issue.
Susan S. Schiffman and C.M. Williams. Journal of
Environmental Quality, 34: 129-138 (2005))

Thanks so much!

Any Questions?

References:

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- ◆ Buck L., Axel R., A Novel Multigene Family May Encode Odorants Receptors: A Molecular Basis for Odor Recognition. *Cell*. Vol.65, 175-187. April 5, 1991.
- ◆ Dalton P. Cognitive Influence on Health Symptoms from Acute Chemical Exposure. *Health Psychology* Vol.18 No.6.579-590 (1999)
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References continued...

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- ◆ Knutson GWA. *ASHRAE Journal*. © American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., April 2003.
- ◆ RosenKranz, HS., Cunningham AR., *Environmental Odors and Health Hazards. The Science of the Total Environment* 313 (2003) 15-24.
- ◆ Schiffman SS, Williams CM. Science of odors as a potential health issue. *J. Environmental Quality* 34: 129-138 (2005)
- ◆ Shusterman D. Odor-associated health complaints: Competing Explanatory Models. *Chemical Senses* 26: 339-343 (2001)
- ◆ Sullivan Jr. JB., Krieger GR., *Clinical Environmental Health & Toxic Exposures*, Second Edition. Lippincott Williams & Wilkins.

Links

- ◆ ATSDR: <http://www.atsdr.cdc.gov/>
- ◆ ATSDR Tox Profiles:
<http://www.atsdr.cdc.gov/toxpro2.html>
- ◆ ATSDR Case Studies:
<http://www.atsdr.cdc.gov/HEC/CSEM/csem.html>
- ◆ Toxnet: <http://www.toxnet.nlm.nih.gov/>
- ◆ Scorecard: <http://www.scorecard.org/>
- ◆ EPA Integrated Risk Information System (IRIS)
<http://www.epa.gov/iris/>
- ◆ CDC recommends:
<http://www.phppo.cdc.gov/cdcRecommends/AdvSearchV.asp>